Umbilical Cord Prolapse

hen spontaneous rupture of membranes occurs if there is normal fetal heart rate monitoring and there are no risk factors for cord prolapse then a routine vaginal examination is not indicated ✓

What is the optimal initial management of cord prolapse in a fully equipped hospital setting?

hen cord prolapse is diagnosed before full dilatation assistance should be immediately called and preparations made for immediate birth in theatre ✓

There are insufficient data to evaluate manual replacement of the prolapsed cord above the presenting part to allow continuation of labour This practice is not recommended D

To prevent vasospasm there should be minimal handling of loops of cord lying outside the vagina D

To prevent cord compression it is recommended that the presenting part be elevated either manually or by filling the urinary bladder D

Cord compression can be further reduced by the mother adopting the knee chest or left lateral (preferably with head down and pillow under the left hip position ✓

Tocolysis can be considered while preparing for caesarean section if there are persistent fetal heart rate abnormalities after attempts to prevent compression mechanically particularly when birth is likely to be delayed ✓

Although the measures described above are potentially useful during preparation for birth they must not result in unnecessary delay ✓

What is the optimal mode of birth with cord prolapse?

Caesarean section is the recommended mode of delivery in cases of cord prolapse when vaginal birth is not imminent in order to prevent hypoxic acidosis B

A category caesarean section should be performed with the aim of achieving birth within minutes or less if the cord prolapse is associated with a suspicious or pathological fetal heart rate pattern but without compromising maternal safety B

Category caesarean birth can be considered for women in whom the fetal heart rate pattern is normal but continuous assessment of the fetal heart trace is essential If the cardiotocograph (CTG becomes abnormal re categorisation to category birth should immediately be considered ✓

Discussion with the anaesthetist should take place to decide on the appropriate form of anaesthesia Regional anaesthesia can be considered in consultation with an experienced anaesthetist ✓

Verbal consent is satisfactory for category caesarean section ✓

Vaginal birth in most cases operative can be attempted at full dilatation if it is anticipated that birth would be accomplished quickly and safely using standard techniques and taking care to avoid impingement of the cord when possible D

Breech extraction is appropriate under some circumstances for example after internal podalic version for a second twin C

A practitioner competent in the resuscitation of the newborn should attend all births that follow cord prolapse ✓

Paired cord blood samples should be taken for pH and base excess measurement D

What is the optimal management in community settings?

Midwives should assess the risk of cord prolapse for women requesting home birth or birth in centres without facilities for immediate caesarean section and at the start of labour in the community

omen with known cord prolapse should be advised by telephone to assume the knee chest face down position while waiting for hospital transfer

During emergency ambulance transfer the knee chest position is potentially unsafe and the exaggerated Sims position (left lateral with pillow under hip should be used

All women with cord prolapse should be advised to be transferred to the nearest consultant led unit for birth unless an immediate vaginal examination by a competent professional reveals that a spontaneous vaginal birth is imminent

The presenting part should be elevated during transfer either manually or by using bladder distension It is recommended that community midwives carry a Foley catheter for this purpose and equipment for fluid infusion

To prevent vasospasm there should be minimal handling of loops of cord lying outside the vagina

Purpose and scope

The purpose of this guideline is to describe the prevention, diagnosis and management of cord prolapse. It addresses those women who are pregnant and at high risk or with a diagnosis of cord prolapse in both hospital and community settings. Pregnancies with cord prolapse before 23^{+0} weeks are not covered by this guideline. All later gestations are covered by the guidance, including those pregnancies at the threshold of viability.

Introduction and background epidemiology

Cord prolapse has been defined as the descent of the umbilical cord through the cervix alongside (occult) or past (overt) the presenting part in the presence of ruptured membranes.[1,2] Cord presentation is the presence of the umbilical cord between the fetal presenting part and the cervix, with or without intact membranes. The overall incidence of cord prolapse ranges from 0.1–0.6%.[1,3–11] In the case of breech presentation, the incidence is higher at 1%.[12] The incidence is influenced by population characteristics and is higher when there is a greater percentage of multiple gestations.[13]

Cases of cord prolapse consistently feature in perinatal mortality enquiries.[14–16] One large study found a perinatal mortality rate of 91 per 1000.[1] Prematurity and congenital malformation account for the majority of adverse outcomes associated with cord prolapse in hospital settings,[1] but birth asphyxia is also associated with cord prolapse.[1,9] Perinatal death has been described with normally formed term babies, especially during home births.[1,15,17] Delay in diagnosis to delivery because transfer to hospital is required appears to be a contributing factor.[1]

The principal causes of asphyxia in this context are thought to be cord compression and umbilical arterial vasospasm preventing venous and arterial blood flow to and from the fetus. There is a paucity of long-term follow-up data of babies born alive after cord prolapse in both hospital and community settings.

The management of cord prolapse is currently one of the labour ward Minimum Data Sets for skills and drills training mandated by the Clinical Negligence Scheme for Trusts (CNST) in England [http://www.nhsla.com/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf] and is a guideline mandated by the Welsh Risk Pool [http://www.wales.nhs.uk/sitesplus/955/page/52730] and Clinical Negligence and Other Risks Indemnity Scheme (CNORIS) [http://www.clo.scot.nhs.uk/our-services/cnoris.aspx] maternity risk management standards in Wales and Scotland respectively.

Identification and assessment of evidence

This guideline was developed in accordance with standard methodology for producing RCOG Green-top Guidelines. MEDLINE, EMBASE, the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials (CENTRAL), the Database of Abstracts of Reviews of Effects (DARE), the ACP

Clinical issues

4.1 What factors are associated with a higher chance of cord prolapse?

Clinicians need to be aware of several clinical factors associated with umbilical cord prolapse

Several clinical features are associated with cord prolapse and they are shown in Table 1 below.[1,5,7,9,10,19,20]

Table Asso t ons t or pro ps n or p s nt t on

General	Procedure-related
	P P P P P
P	P P P P P
P P +0 PP	P P P P P
P P P	P P
PP P P	
P P P P P	P P P P P P
P	P P P
P P P P	
P	
P P P P P P P P +0 PP	

Interventions can result in cord prolapse, with approximately half of the cases reported being preceded by obstetric intervention.[21] **The manipulation of the fetus during external cephalic version, internal podalic version of the second twin, manual rotation, placement of intrauterine pressure catheters (with or without prior membrane rupture)**[21,22] **and artificial rupture of membranes,**[11,21] **particularly in the presence of an unengaged presenting part, are the interventions that most frequently precede cord prolapse. In general, these factors predispose to cord prolapse by preventing close application of the presenting part to the lower part of the uterus and/or pelvic brim.**

One study of induction of labour using transcervical balloon catheters showed a significant increase in the rate of cord presentation after inflation with saline above 180 ml.[20]

Amnioinfusion is used for suspected umbilical cord compression in labour. Large studies would be required to detect an increased risk of cord prolapse associated with this of the pr

Selective ultrasound screening can be considered for women with breech presentation at term who are considering vaginal birth

In a Canadian study, cord prolapse was preceded by the identification of cord presentation at routine ultrasound (real time with colour mapping) in only 12.5% of cases. Just one of 13 cases of suspected cord presentation developed cord prolapse.

4.4 When should cord prolapse be suspected?

Cord presentation or prolapse should be excluded at every vaginal examination in labour and after spontaneous rupture of membranes if risk factors are present

In addition to the national guidance for fetal heart rate monitoring in labour the fetal heart rate should be auscultated after every vaginal examination in labour and after spontaneous membrane rupture

Cord prolapse should be suspected when there is an abnormal fetal heart rate pattern especially if such changes commence soon after membrane rupture either spontaneous or artificial

Speculum and or digital vaginal examination should be performed when cord prolapse is suspected

hen spontaneous rupture of membranes occurs if there is normal fetal heart rate monitoring and there are no risk factors for cord prolapse then a routine vaginal examination is not indicated

Vaginal examination and membrane rupture can provoke cord prolapse (see Table 1).[5]

Mismanagement of abnormal fetal heart rate patterns is a feature identified in perinatal death associated with cord prolapse. Bradycardia or variable fetal heart rate decelerations have been associated with cord prolapse and their presence should prompt vaginal examination.[35] In one series of 89 cases of cord prolapse in women being monitored electronically, each case had abnormalities of the fetal heart rate; 66% had variable decelerations and 34% had a prolonged deceleration of more than 1 minute or persistent bradycardia.[36]

Prompt vaginal examination is the most important aspect of diagnosis and should be performed if there is a particularly high risk of cord prolapse: for example, rupture of membranes with high presenting part or rupture of membranes with polyhydramnios.

Cord presentation and prolapse may occur without outward physical signs and with a normal fetal heart rate pattern and might first be diagnosed at routine vaginal examination in labour.[1]

4.5 What is the optimal initial management of cord prolapse in a fully equipped hospital setting?

hen cord prolapse is diagnosed before full dilatation assistance should be immediately called and preparations made for immediate birth in theatre

There are insufficient data to evaluate manual replacement of the prolapsed cord above the presenting part to allow continuation of labour This practice is not recommended

To prevent vasospasm there should be minimal handling of loops of cord lying outside the vagina

To prevent cord compression it is recommended that the presenting part be elevated either manually or

possible in one woman and vaginal birth was imminent in another two. The prolapsed cord was successfully replaced in the five other women. The prolapsed segment was described as short in all five. Continuous fetal heart rate monitoring was used before, during and after the replacement. Typically there was a prolonged deceleration of 4 minutes during the replacement. Two fetuses (40%) had persistent cardiotocographic abnormalities after the reduction and in both the umbilical artery blood gas pH was less than 7.25 after birth. There were no neonatal deaths or Apgar scores of less than 7 at 5 minutes, but other short- or long-term outcome measures of neonatal morbidity were not reported.[37] In this study all five women where replacement was successful had a vaginal birth. These data are insufficient to support cord replacement and this should not be used outside

Category caesarean birth can be considered for women in whom the fetal heart rate pattern is normal but continuous assessment of the fetal heart trace is essential If the cardiotocograph (CTG becomes abnormal re categorisation to category birth should immediately be considered

Discussion with the anaesthetist should take place to decide on the appropriate form of anaesthesia Regional anaesthesia can be considered in consultation with an experienced anaesthetist

Verbal consent is satisfactory for category caesarean section

Vaginal birth in most cases operative can be attempted at full dilatation if it is anticipated that birth would be accomplished quickly and safely using standard techniques and taking care to avoid impingement of the cord when possible

Breech extraction is appropriate under some circumstances for example after internal podalic version for a second twin

A practitioner competent in the resuscitation of the newborn should attend all births that follow cord prolapse

Paired cord blood samples should be taken for pH and base excess measurement

Caesarean section is associated with a lower perinatal mortality and reduced risk of Apgar score less than 3 at 5 minutes compared to spontaneous vaginal birth in cases of cord prolapse when vaginal birth is not imminent.[9] However, when vaginal birth is imminent, outcomes are similar or better compared with caesarean section.[1,8]

There is poor correlation between the decision-to-delivery interval (DDI) and umbilical cord pH.[50–53] The 30-minute DDI is the acknowledged target for category 1 caesarean section [http://www.nhsla.com/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf].[54] The unit average interval between decision and childbirth for fetal concern in maternity departments in the UK ranges between 30 and 40 minutes,[49] but in the National Sentinel Caesarean Section Audit,[55] for cases with cord prolapse the median interval was 17 minutes and 75% of births were performed within less than 26 minutes (interquartile range 12–26). It has been acknowledged that maternal safety and attention to the individual woman is more important than fixation on time targets.[56]

For women at and beyond 26+0

Elevation of the presenting part during transfer may prevent cord compression.[67,68] Evidence level 3

There are concerns that manipulation of the cord or exposure to air may cause reactive vasoconstriction and fetal hypoxic acidosis.[2,38,39] Some authorities advise that swabs soaked in warm saline are wrapped around the cord but this is of unproven benefit.[37,38]

4.8 What is the optimal management of cord prolapse at the threshold of viability?

Expectant management should be discussed for cord prolapse complicating pregnancies with a gestational age at the threshold of viability (to weeks D

Clinicians should be aware that there is no evidence to support replacement of the cord into the uterus when prolapse occurs at or before the threshold of viability D

omen should be counselled on both continuation and termination of pregnancy following cord prolapse at the threshold of viability ✓

At the threshold of viability (23^{+0} to 24^{+6} weeks), temporary measures have been recorded for periods up to 3 weeks.[2,69–71] Evidence level 3

Some women might prefer to choose termination of pregnancy, perhaps after a short period of observation to see if labour commences spontaneously. Late termination of pregnancy requires specialist expertise and should only be performed in context of recommendations of the RCOG.[72] There should be a clear distinction between augmentation of labour with the intention of delivering a live baby and termination of the pregnancy where the intention is that the baby is not born alive, since if over 21^{+6} weeks, feticide must be considered. Evidence level 4

There is one reported case of cord replacement at 23^{+0} weeks of gestation. The woman was in labour and vaginal birth occurred after 8 hours.[37] There have been no reports of cases in which uterine replacement of the cord was used to assist expectant management of cord prolapse at extreme preterm gestation.

There are no data to guide decisions about the timing of birth. It should be considered if there are signs of severe fetal compromise once viability has been reached or a gestational age associated with a reasonable neonatal outcome is achieved. Some women might prefer to run a high risk of fetal death in order to achieve a gestational age associated with a better chance of intact neonatal survival.

4.9 Should delayed cord clamping (DCC) be used after cord prolapse?

Delayed cord clamping can be considered if a baby is uncompromised at birth B

Immediate resuscitation should take priority over DCC when the baby is unwell at birth D

A Cochrane Review concluded that, in term infants, delayed cord clamping (DCC) should be assessed at each birth, especially in infants where access to good nutrition is poor, and this simple intervention may be advantageous.[73]

In a systematic review of preterm infants (less than 37^{+0} weeks of gestation), DCC for up to 180 seconds was associated with fewer blood transfusions for anaemia, better circulatory stability, fewer intraventricular haemorrhages (all grades) and a lower risk of necrotising enterocolitis. The risk of death or high-grade intraventricular haemorrhage was not found to be significantly different.[74] The UK newborn resuscitation guideline 2010 states 'For uncompromised babies, a delay in cord clamping of at least one minute from the complete delivery of the infant, is now recommended.'[75] The recommendation also states that most preterm babies are uncompromised and in need of stabilisation rather than resuscitation and therefore the recommendation might be equally applied to them as it is to uncompromised babies at term.

Most studies have excluded babies who require resuscitation at birth. There is, therefore, insufficient evidence to make a recommendation for babies requiring resuscitation.[76]

Clinical governance

5.1 Explanation of events

An opportunity to discuss the events should be offered to the woman (possibly with her companions in labour) at a mutually convenient time

After obstetric emergencies, women can be psychologically affected by postnatal depression, post-traumatic stress disorder or fear of further childbirth. Women with cord prolapse and those who undergo urgent transfer to hospital might be particularly vulnerable to emotional problems.[67]

5.2 Training

All staff involved in maternity care should receive training in the management of obstetric emergencies including the management of cord prolapse

Training for cord prolapse should be multidisciplinary and include team rehearsals

Updates on the management of obstetric emergencies (including the interpretation of fetal heart rate patterns) are a proactive approach to risk management. CNST [http://www.nhsla.com/safety/Documents/CNST%20Maternity%20Standards%202013-14.pdf], CNORIS [http://www.clo.scot.nhs.uk/our-services/cnoris.aspx] and Welsh Risk Pool [http://www.wales.nhs.uk/sitesplus/955/page/52730] standards currently mandate that all staff involved in maternity care should attend regular multidisciplinary rehearsals (skill drills) including the management of cord prolapse according to a local training needs analysis (see Appendix 1).

The Simulation and Fire-drill Evaluation (SaFE) Study showed that practical, multidisciplinary, obstetric emergency training increased midwives' and doctors' knowledge of emergency management[77] and improved the management of simulated obstetric emergencies in general.[78,79]

One study of training did not demonstrate any benefit for the management of cord prolapse;[80] in

Recommendations for future research

- Prospective study of diagnosis–birth interval for spontaneous and assisted vaginal births and category 1 caesarean sections in cases of cord prolapse, combined with outcomes at appropriate long-term follow-up.
- Should cord replacement be used in cases at the threshold of viability?

Appendix I

Appendix II Cord prolapse documentation proforma

Please tick the relevant boxes:

Senior midwife called: **Yes** ☐ **No** ☐

Time called:..... **Time called:**..... **Name:**.....

Obstetrician called: **Yes** ☐ **No** ☐

Time called:..... **Time called:**..... **Name:**.....

Grade of obstetrician:.....

Anaesthetist called: **Yes** ☐ **No** ☐

Time called:..... **Time called:**..... **Name:**.....

Neonatologist called: **Yes** ☐ **No** ☐

Time called:..... **Time called:**..... **Name:**.....

Diagnosed at home or hospital: **Home** ☐ **Hospital** ☐

Time of diagnosis:.....

Cervical dilation at diagnosis:.....**cm**

Procedures used in managing cord prolapse		
Elevating the presenting part manually	**Yes**	**No**

Appendix III Explanation of guidelines and grades

Clinical guidelines are: 'systematically developed statements which assist clinicians and patients in making decisions about appropriate treatment for specific conditions'. Each guideline is systematically developed using a standardised methodology. Exact details of this process can be found in Clinical Governance Advice No.1 (available on the RCOG website at http://www.rcog.org.uk/green-top-development). These recommendations are not intended to dictate an exclusive course of management or treatment. They must be evaluated with reference to individual patient needs, resources and limitations unique to the institution and variations in local populations. It is hoped that this process of local ownership will help to incorporate these guidelines into routine practice. Attention is drawn to areas of clinical uncertainty where further research may be indicated.

The evidence used in this guideline was graded using the scheme below and the recommendations formulated in a similar fashion with a standardised grading scheme.

	At least one meta-analysis, systematic review or randomised controlled trial rated as 1++ and directly applicable to the target population; or
	A systematic review of randomised controlled trials or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results
	A body of evidence including studies rated as 2++ directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+
	A body of evidence including studies rated as 2+ dir of reof rT[C12 gs 0 0 0 1 k q[(0568.99ed as 3(g9.79 76.1.7

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